Name: Date:

# Exam: Function Reflections (Solution version 5)

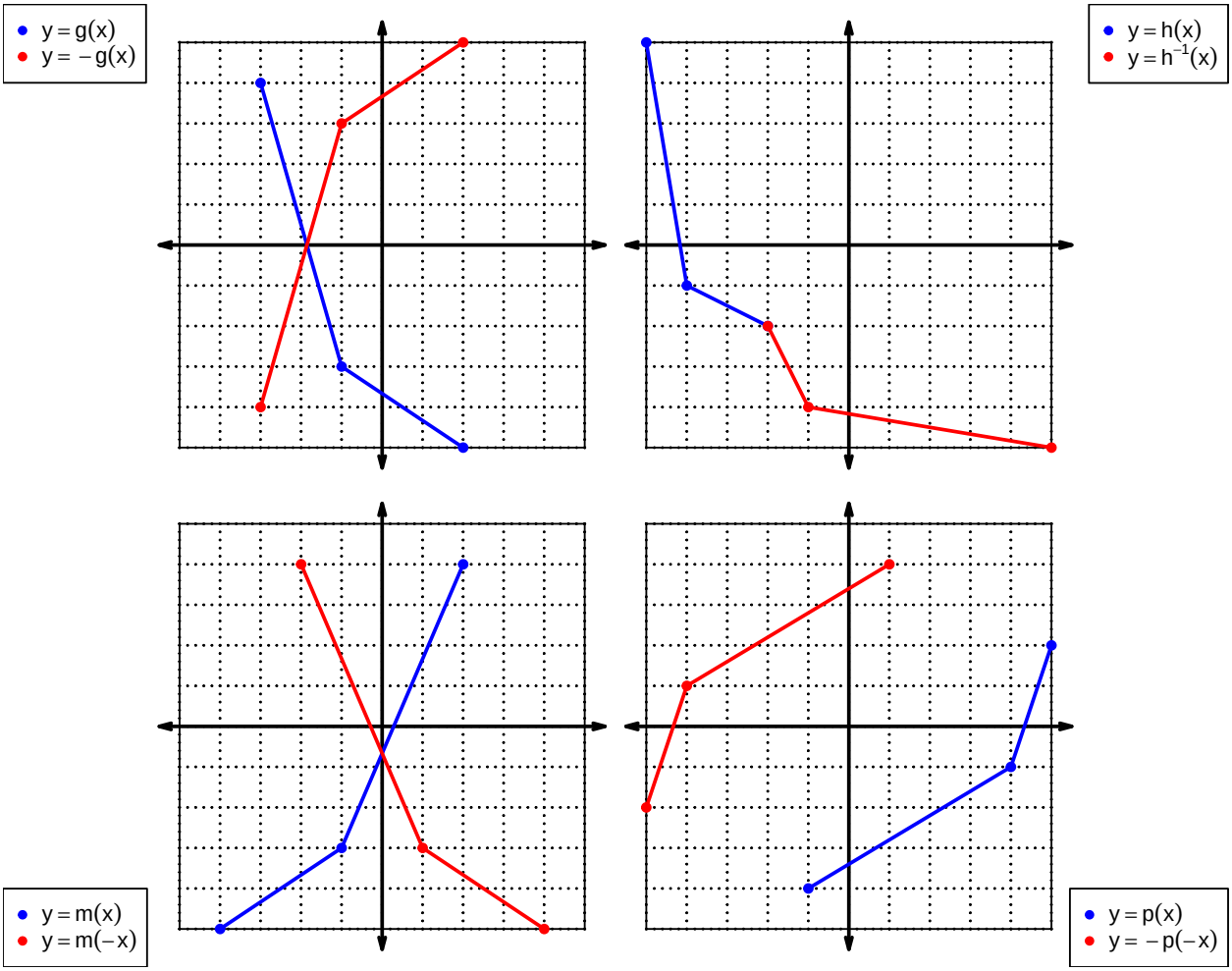
1. Let function $f$ be defined by the polynomial below:

$$f(x) = 4x^5 - 2x^4 - 9x^3 - 8x^2 - 6x + 5$$

Draw lines that match each function reflection with its polynomial:

| Reflections | Polynomials |
|---|---|
| $-f(x)$ | $-4x^5 + 2x^4 + 9x^3 + 8x^2 + 6x - 5$ |
| $f(-x)$ | $-4x^5 - 2x^4 + 9x^3 - 8x^2 + 6x + 5$ |
| $-f(-x)$ | $4x^5 + 2x^4 - 9x^3 + 8x^2 - 6x - 5$ |

2. In each $xy$ plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The $x$ axis is horizontal and the $y$ axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions $f$, $g$, and $h$ are defined by the table below.

| $x$ | $f(x)$ | $g(x)$ | $h(x)$ |
|---|---|---|---|
| 1 | 1 | 9 | 8 |
| 2 | 5 | 6 | 4 |
| 3 | 9 | 2 | 9 |
| 4 | 3 | 7 | 1 |
| 5 | 4 | 1 | 2 |
| 6 | 8 | 4 | 3 |
| 7 | 6 | 8 | 7 |
| 8 | 2 | 3 | 5 |
| 9 | 7 | 5 | 6 |

3. Evaluate $f(9)$.

$$f(9) = 7$$

4. Evaluate $h^{-1}(1)$.

$$h^{-1}(1) = 4$$

5. By filling more rows of the table, it is possible to make function $h$ **even**. If that were done, what would be the value of $h(-3)$?

If function h is even, then

$$h(-3) = 9$$

6. By filling more rows of the table, it is possible to make function $g$ **odd**. If that were done, what would be the value of $g(-8)$?

If function g is odd, then

$$g(-8) = -3$$

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7. A function, $f$, is **even** if $f(x) = f(-x)$ for all $x$ in the domain. A function, $g$, is **odd** if $g(x) = -g(-x)$ for all $x$ in the domain.
   Let polynomial $p$ be defined with the following equation:

$$p(x) = -x^2 - 1$$

   a. Express $p(-x)$ as a polynomial in standard form.

$$p(-x) = -(-x)^2 - 1$$
$$p(-x) = -x^2 - 1$$

   b. Express $-p(-x)$ as a polynomial in standard form.

$$-p(-x) = -\left(-x^2 - 1\right)$$
$$-p(-x) = x^2 + 1$$

   c. Is polynomial $p$ even, odd, or neither?

   even

   d. Explain how you know the answer to part c.

   We see that $p(x) = p(-x)$ for all $x$ because $p(x)$ and $p(-x)$ are equivalent polynomials. Thus function $p$ satisfies the criterion for being an even function.

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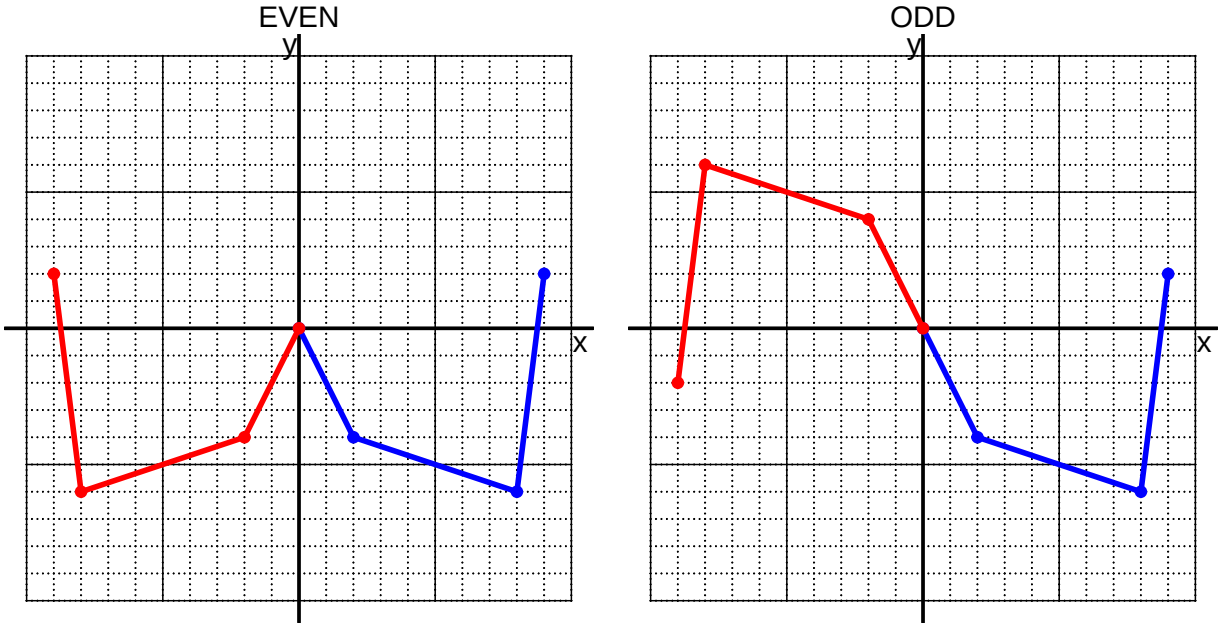
8. I have drawn half of a function. Draw the other half to make it even or odd.




9. Let function $f$ be defined with the equation below.

$$f(x) = 3x + 8$$

a. Evaluate $f(11)$.

step 1: multiply by 3
step 2: add 8

$$f(11) = 3(11) + 8$$
$$f(11) = 41$$

b. Evaluate $f^{-1}(83)$.

step 1: subtract 8
step 2: divide by 3

$$f^{-1}(x) = \frac{x - 8}{3}$$
$$f^{-1}(83) = \frac{(83) - 8}{3}$$
$$f^{-1}(83) = 25$$

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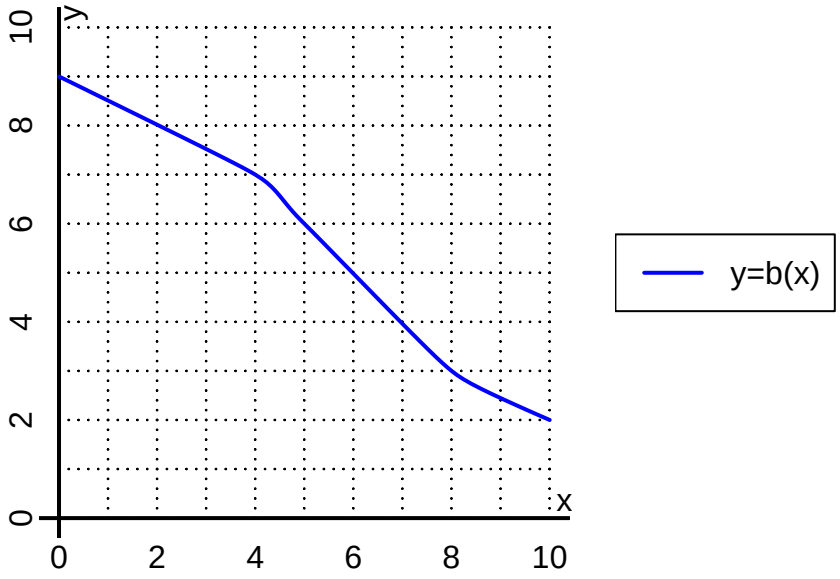
10. The function $b$ is represented by the curve $y = b(x)$ graphed below.




a. Evaluate $b(5)$.

$b(5) = 6$

b. Evaluate $b^{-1}(7)$.

$b^{-1}(7) = 4$

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11. Function $f$ is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

| $x$ | $f(x)$ | $-f(x)$ | $f(-x)$ | $-f(-x)$ |
|---|---|---|---|---|
| -2 | 3 | -3 | 3 | -3 |
| -1 | 5 | -5 | -5 | 5 |
| 0 | 0 | 0 | 0 | 0 |
| 1 | -5 | 5 | 5 | -5 |
| 2 | 3 | -3 | 3 | -3 |

b. Is function $f$ even, odd, or neither?

neither

c. How do you know the answer to part b?

Function $f$ is neither because neither column $-f(-x)$ nor column $f(-x)$ matches column $f(x)$ exactly.